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Schuer, Robert; Wilson, Tina; Valkenberg, Willem van and Lane, Andrew (2010). Production of OER: a quest for efficiency. In: 7th Annual Open Education Conference, 2-4 Nov 2010, Barcelona, Spain.

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Version: Version of Record

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# Production of OER, a Quest for Efficiency

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## **Abstract**

In most initiatives to publish Open Educational Resources (OER), the production of OER is the activity with the highest costs. Based on literature and personal experiences a list of relevant characteristics of production processes for OER are determined. Three cases are compared with each other on these characteristics. Most influence on costs are human costs and the type of OER created.

## **Keywords**

OER, production

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## **Recommended citation:**

Schuwer, Robert; Wilson, Tina; Van Valkenburg, Willem et al. (2010). Production of OER, a Quest for Efficiency. In *Open Ed 2010*. Barcelona: UOC, OU, BYU.  
[Accessed: dd/mm/yy].<<http://hdl.handle.net/10609/5103>>

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# 1. Introduction

In most initiatives to publish Open Educational Resources (OER), the production of OER is the activity with the highest costs. Having an efficient production process therefore is an important precondition for a sustainable offering of OER. Several approaches exist, each dependent on the context in which production takes place.

In this paper, the relevant properties of such production processes were identified from the available literature. Three specific approaches are elaborated upon and compared against the identified properties. Some generic conclusions are then drawn about which of the characteristic properties of the processes are identified as being most important for determining the most efficient production process for OER publication.

## 2. .The playing fields

In this section, three initiatives will be described each having a different production process for OER.

### 2.1. Open Universiteit (the Netherlands)

In 2006, the Open Universiteit started with its experiment OpenER. The goal was to lower existing thresholds to academic course materials for non-traditional groups (i.e. employed and unemployed people) and thereby achieve higher participation in higher education (Schuwer and Mulder, 2009). To this end, 25 courses were created with a study load of about 25 hours each. The initial idea was to derive courses for OpenER from existing regular courses. For each of the schools, this meant identifying an appropriate course, selecting a complete subject within this course, and creating the material (self-contained, creation of an introductory text, providing a self test). During the course of the experiment, several courses were developed “from scratch” especially meant for this experiment. In figure 1, the production process is depicted.

For each regular course at the Open Universiteit, it is registered which persons and organisations have IP rights on elements of the course. This was very helpful for the IP expert for the OER that was derived from a regular course, making the process of IP clearing efficient.

Most authors of the courses were experienced in creating courses and using the e-tools. The QA was organised by the author (in most cases peer review by a colleague). Support came from

Communication, the project leader and the IP expert. The process to create the OER was neither standardized nor automated. Each author had its own way of working. Only in the last phase, with the conversion of the course materials to the website, a more or less standard process was followed. This included some conversion because the platform used for the OER was different from that for regular courses (eduCommons vs. Blackboard).

The types of OER created included textual sources (in most cases, published as pdf- and rtf-document), videos and several interactive elements (among which a serious game).

The OER is published under a Creative Commons Attribution-Non Commercial-Share Alike license. So rework and reuse is permitted by consumers of the website, but the reworked course cannot be published in the OER repository of the Open Universiteit.

## 2.2. Open University UK

The Open University in the UK (OUUK), a distance learning university, caters for annual student numbers of just over 200,000 (<http://www.open.ac.uk/>). A proportion of these materials (in excess of 15,000 study hours) are accessible worldwide mainly through its Open Content Initiative (OpenLearn), which was launched in October 2006. OpenLearn was, in part, developed to provide equal access to education and support the University's social inclusion agenda.

OpenLearn operates in an environment based on the Moodle course management system (OUUK Moodle is a development of core Moodle and has bespoke features<sup>4</sup>). It hosts twin Websites; a LearningSpace aimed at learners and a LabSpace aimed at educators. Units of material on OpenLearn are taken from the original Supported Open Learning version of a course. In the OpenLearn context the materials called 'study units' are standalone without the organised tutorials and formal assessment typically found in the original course. OpenLearn provides similar facilities to the OUUK's student facing Moodle based Virtual Learning Environment (VLE) but in an open and accessible environment, which differs in some aspects from the delivery of regular courses.

Originally developed for distance learners the material is already suitable for self-study. OER study units vary between one and fifty hours of study time (Lane et al, 2010). More information is available about OpenLearn (Downes, 2006/2007; McAndrew, et al., 2009) and the OER in the LearningSpace ([openlearn.open.ac.uk](http://openlearn.open.ac.uk)) and LabSpace ([labspace.open.ac.uk](http://labspace.open.ac.uk)) subject areas'.

### 2.2.1 The OpenLearn transformation process

OpenLearn's preferred format for OER development, upload and download at launch was through an OUXML structured content schema, though other transformation formats were soon introduced.

The OpenLearn transformation process was supported by a large team initially, to meet ambitious targets of publishing 13,500 study hours by April 2008. The OpenLearn team included academics; technical, media, copyright and project support staff many with experience of standard educational material production for student use. In order to meet these targets, a new set of related methods, processes, procedures and documentation were devised, revised and updated.

A key factor in developing OER is the need to determine whether the source material is deemed suitable for transfer. Issues and suggested criteria for judging the suitability of course material for

OER delivery is discussed by Wilson (2007), while a number of models of transformation were proposed at the beginning of the initiative (Lane, 2006 and Lane, 2007) and reviewed later (Lane et al, 2010). The majority of the OER in OpenLearn are transformed under what Lane terms the ‘Integrity model’, where essentially all of the material in the subsequent OER is recognisably similar to the material being studied by students on the originating course.

Connolly et al. (2007) discuss the process of transformation under the ‘Integrity model’ using a flowchart (Connolly, 2007). An overview of the key stages is listed below (Figure 2) and serves as a reminder that the transformation process involves much more than the use of XML.

These more people centric characteristics are important in the development of OER and indicate that the technology alone does not support the transformation of material into OER.

## 2.3. Delft University of Technology

Delft University of Technology is a traditional brick-and-mortar university in The Netherlands. The university only offers engineering education in Bachelor and Master for Dutch and more and more international students. The university has 17,000 students.

In 2007 the university started with their OpenCourseWare project. In October 2007 their [ocw.tudelft.nl](http://ocw.tudelft.nl) website was launched with 14 courses. 2,5 years later they have 40 courses online. The reason to launch an OpenCourseWare website were diverse from marketing to exposure for a specific department.

Starting point is that the existing content used in the Digital Learning Environment for the regular students is good enough for the rest of the world. So all the courses are based on their regular course.

### 2.3.1. The Process

To publish a new OCW-course we first create a copy of the current Blackboard course to a new one. Then the instructor and mostly his teaching assistants modify the course to satisfy the guidelines of OpenCourseWare:

- **Quality of the resources**  
The materials will be put in the window of the university, so we have to be sure it is high quality material
- **Completeness**  
After removing the resources that are not suited for publication, there must be enough resources left to be recognized as course.
- **Copyright**  
Only resources that are cleared for copyright will be published.
- **Suitability for self-study**  
The regular courses have an instructor and classes that will lead the students through the material. An OCW-course doesn’t have this, so we need to add some instructions for the learner to guide him through the material.

When this process is fulfilled and the bureau OpenER and the instructor have agreed to publish the course, a script transfers the Blackboard course to our OpenCourseWare website. Some small modifications have to be done to get the course ready.

The course will then be checked by some peer instructors before it will be publically available on [ocw.tudelft.nl](http://ocw.tudelft.nl).

### 3. Properties of production processes for OER

Open Educational Resources describes digitalized materials offered freely and openly for use and re-use in teaching, learning and research (UNESCO, 2002). OER includes educational materials and course materials in particular.

There are several production processes to create OER. To gather more information about these processes, 61 cases on (OPAL, 2010) were analysed. Table 1 shows the different processes found in these cases.

In some cases, more than one of the above processes was mentioned by the authors/contributors. Therefore, the numbers add up to > 61.

Each of these processes has components or characteristics that influence the efficiency and costs of the process. Because production of OER normally has some activities that differ from the production of regular courses, it is not enough to just consider production of the latter category. Some of these additional activities are:

- For publishing under an open license, IP clearance must be carefully carried out. In most cases, for regular courses this IP clearance is partially done.
- Teachers and institutions tend to give more attention to Quality Assurance (QA) when they know their materials will be published as open content ("the whole world will be my audience").

Based on (Wikiversity, 2010), (Wikieducator, 2010) and experiences with the three cases described, a list of characteristics of production processes for OER (in random order) is retrieved. Table 2 presents this list and provides an analysis of the three cases on each characteristic.

The characteristics are not independent of each other. For example, the organisation of QA **could be** influenced by the possibility of consumers adding their content to the OER repository, leading to another cost effect. These possible relationships make it difficult to point to the characteristics with the most effect on production costs.

In the case of OER production for OpenLearn, it approximately costs €3600 on average per study hour to produce the original teaching material, it then cost about €360 on average to transform and publish making a 10 hour study unit cost about €3600 to publish, but this average hides a wide range and there were a few pretty expensive ones (either because of IP costs or media costs) that probably did cost up to 3 times that. In the end no accurate costing was done. The figures are arrived at by dividing aggregate figures for spend on production over two years by the number of study units and the hours published with the former a very broad figure where some costs may be best taken out for comparison. Study units tended to be more expensive as a result of IP costs or media costs.

This observation is in line with the experiences on Opener OU. There is a wide range in which the costs lie. The average cost per unit is lower than at OpenLearn. The main reason for this difference seems to be that each course at Opener OU only has one or two formats to which it is published. For each unit at OpenLearn, several different formats exist, each having its own conversion problems.

The costs per 1 ECTS course vary a lot between the three cases. For the OU and the OUUK, there is a wide deviation of the average costs, caused by a few expensive courses. The actual size of the study unit also makes a difference. For example a 50 hour study unit could be the least expensive per hour to transform if the bulk of the unit is formed of text and the study time is influenced more by the number of activities learners have to do rather than the number of words that need to be read. The development costs include costs for the actual production of the course (including author costs, costs for creating interactive elements, costs for QA) for Opener OU and Delft Opener (not applicable in the case of OUUK OpenLearn), costs for IP clearing, costs for conversion of the materials to the OER publishing environment and costs for creating any additional interactive elements. Other costs like management of the IT environment or costs of specific software are not included.

## 4. Conclusion

Our research revealed a list of characteristics that influences the cost of the production process for an open course. Comparing three cases, there were considerable differences between the costs per ECTS. Within each case, the variation between different courses was also great. The main cost factors in course production are the human costs, which is perhaps unsurprising since this is the case for all media production. Material costs are small compared to the costs of human stakeholders and are therefore not included in the analysis. Ability for consumers to add to the repository of open courses, does not lead to more costs for QA at OUUK. Characteristics having the most influence are (not surprising):

- The part of the process that is automated. The more is automated, the less costs.
- The size of the supporting staff
- The type of OER created. The more interactive and multimedia elements, the higher the costs. However, the use of these technologies makes these course materials more accessible for a wider variety of learners.

Our experiences in this research are to be investigated more deeply to find out more characteristics and the interrelation between them. As an example, course production is a primary activity for a university. When you are able to have the OER-derivative developed as a natural "product aside", the extra costs for development will probably be the lowest, compared to other ways of producing OER. Also, models for centralised versus distributed production are worth investigating more deeply.

## Figures and Tables

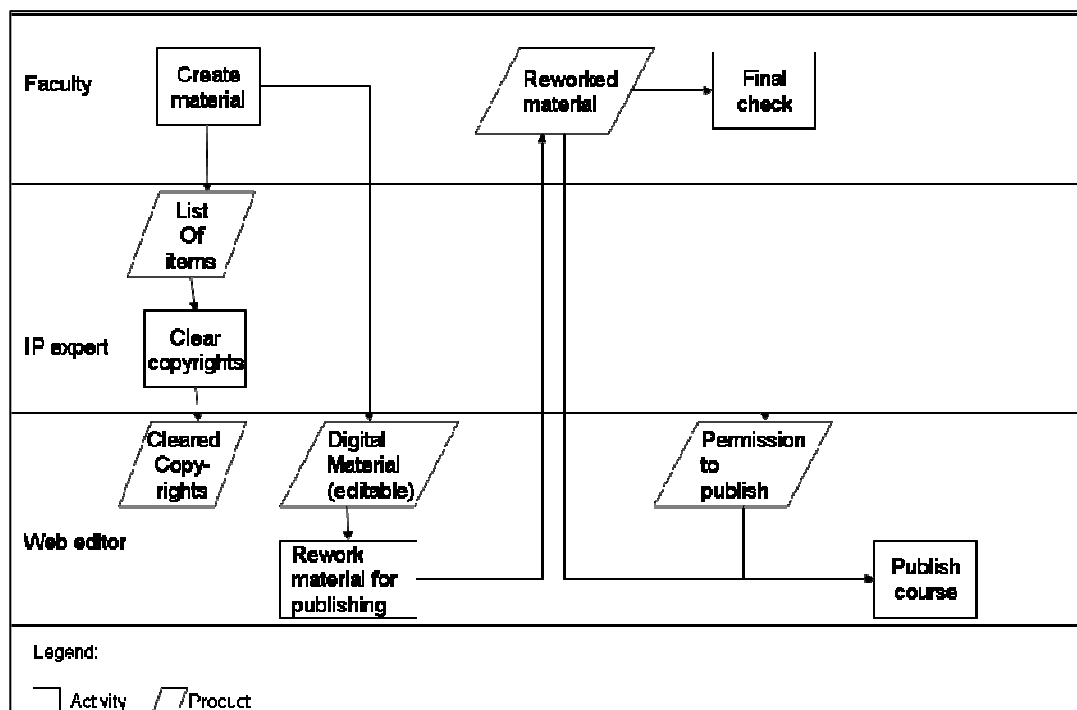


Figure 1. Production process of OER at Open Universiteit

1. Identify material for transformation from a Central Academic Unit and decide on the appropriate topic area within OpenLearn.
2. Central Academic Unit complete a pro forma
3. Electronic copies of the original materials are sourced
- 4.a Copyright issues with third party material are considered (Lane, 2007)
- 4.b Ownership of the material is considered
5. Usage of the proposed material in Professional Development courses is considered
6. The material then undergoes an initial review by an OpenLearn Academic.
7. After the initial review has drawn up a specification for how the material should be transformed, the materials are handed over to the media sub-team for XML tagging, editing and conversion into an OER.
8. A final review (of the pre-release OER) is undertaken by the OpenLearn academic and Faculty academics. The OER is checked against the original material and the specification on the initial review form.
9. When the final review is complete the media sub team publish the OER.

Figure 2. Key stages of the 'Integrity Model'



Production process	#	Remarks
Derived from existing regular “closed” course materials	31	Sometimes as part of the mainstream process and sometimes using a workflow additional to the mainstream process
Additional “raw” materials from existing “closed” courses, but relatively easy to produce	7	E.g. videocasts or podcasts of classes
Course materials produced especially for an OER repository	7	In most cases additional to the first mentioned scenario.
Other models	2	Including user generated materials
Not described/not applicable	22	Not applicable: mostly because the case was about creating a portal to access existing (open) learning materials or to create communities around existing open learning materials

**Table 1**

Characteristic	Analysis
Availability of existing (raw) materials	Only in Delft existing materials were available. This had a positive effect on the time spent by each author, leading to a less expensive process. The bureau OpenER does a quick scan of the existing Blackboard course in one to two hours. The result is a list of issues the instructors have to solve.
Availability of registration of IP for existing learning materials	In all three cases such registration was available. At the OU, the fraction of IP clearance costs was low (about 5% of the costs). Because of this registration, some authors were aware of copyrighted materials and replaced these parts by openly available materials (e.g. pictures), which reduced the amount of work done by the IP expert.  In some cases (at the OUUK) alternatives were found, proportions of the original content were cleared or in some cases all of the 3 <sup>rd</sup> party content was cleared. Costs of clearance were lower than budgeted for and in many cases lower than for original student use. There has been a 97% clearance rate with only a few outright refusals and a few where cost of clearance was deemed prohibitive. In Delft there is no payment for any included materials to externals. If IP-material was included, it was left out or replaced with CC-content.
Organisation of Quality Assurance: <ul style="list-style-type: none"> <li>QA activities are (partly) performed by consumers</li> </ul>	At the OU, QA by peer review is part of the regular course production. The QA awareness of each author is on a high level, so the percentage of “first time right” course materials is high (especially when the open course is derived from a regular closed course).

<p>instead of by the institution</p> <ul style="list-style-type: none"> <li>• QA can be undertaken by an institution in terms of internal peer review</li> <li>• QA can be undertaken by an institution in terms of external examiners feedback</li> </ul>	<p>At the OUUK QA by peer review and external examiners is part of regular course production. For open publication on Openlearn there are further, simpler reviews mainly of technical integrity of the transformation.</p> <p>At Delft, before a new course on OCW is released, the course is peer-reviewed by others. Currently, Delft is in the process of formalizing this.</p>
<p>Experience of course authors (both in writing and in using appropriate tools)</p>	<p>At the OUUK OpenLearn Academics with the support of faculty staff transformed the materials in terms of the content. Conversion of format from one medium to another was conducted by the OpenLearn media team supported by the technical team.</p> <p>In Delft the experience of the authors varied. The time it takes to get a course online varies. There are two variables: the experience of the teacher and the complexity of the course. The complexity of the course is not related to the number of ECTS-points.</p>
<p>Size and activities of the supporting staff department</p>	<p>At the OUUK, this team was large initially, as many courses needed to be converted into OER in a relatively short period, and many conversion formats that were used for publishing the courses. Subsequent to start up funding, OpenLearn had much lower production targets and all study units were transformed under the 'integrity model' (expensive experiments disappeared) while production processes and technologies for student use and open use have been and are being harmonised such that publication is an embedded part of standard course development.</p>
<p>The degree to which the process is standardized or automated</p>	<p>Although the degree of automation of the process at OUUK is high, this does not lead to lower costs for units compared to Opener OU. This can be explained by the observation that still a lot of person centric activities are needed that can hardly be automated. In Delft, the first courses were converted manually. This took between 8 and 16 hours per course. After automation of this activity, per course less than an hour is needed.</p>
<p>Consumers are able to add new content to the OER repository</p>	<p>This is only possible at the OUUK. When users publish their own content in the LabSpace the costs to the OUUK are only in supporting the platform and possibly providing training. There are no direct production costs unless the OUUK is publishing into the LabSpace itself. So far mainly pdfs of complete teaching texts have been added to the LabSpace which are very cost effective in terms of hours if not usability by users. In general, the effect of this criterion on the cost effectiveness and efficiency is complex. On the one hand, part of creation and maintenance is done by external stakeholders without costs. On the other hand, extra activities might be necessary to guarantee the materials will adhere to QA standards</p>

	of the institution.
A whole course can be divided in separate OER units	In some cases, whole courses of material (from the OUUK itself and from other universities (in the OpenLearn LabSpace) were separated into different study units (for OpenLearn). The separate study units could spread across different topic areas indicating the interdisciplinary nature of the original course. Academics initially found it difficult to make the whole course into separate stand alone units.
Type of OER created <ul style="list-style-type: none"> <li>• Text</li> <li>• Audio and / or video</li> <li>• Interactive elements</li> </ul>	It is not surprising that the least expensive course is a text-based course without any interactive elements or video, derived from a regular course. The more interactive elements were added, the more expensive the course became.
The publishing platform for OER	There is a negative effect on the costs when the publishing platform differs from the platform used for regular courses because of the transformations of the course materials. Automating this task (as was done by Delft) lowers this effect. The characteristics of the platforms themselves are not taken into consideration in this comparison.

**Table 2**

## Notes

The work discussed in this paper is supported by a number of projects:

- OpenLearn was supported by a grant from the William and Flora Hewlett Foundation.
  - OpenER was supported by grants from the Directorate Learning and Working, established by the Dutch Ministry of Education, Culture and Science and the Ministry of Social Affairs and the William and Flora Hewlett Foundation.
1. OpenLearn (OUUK) has recently relaunched OpenLearn in a new front end based on Drupal ([www.open.ac.uk/openlearn/](http://www.open.ac.uk/openlearn/)) which includes aggregated short form content from different sources.

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